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NATURAL RESOURCES : THE ORGANISATION OF A GENERAL METEOROLOGICAL SERVICE

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NATURAL RESOURCES

The Organisation of a General Meteorological Service

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1. In order that meteorological services can be of a real benefit to the less developed areas they must be, at the least, of the same standards as those in richer countries. It can be taken for granted that the indigenous peoples of the less developed areas are far from completely educated to, and capable of, running these services for which highly complex and modern techniques are indispensable. The lack of ability to pay for these services from local resources can also be taken for granted. These facts are particularly true of a modern meteorological service meeting the requirements of:

(a) aviation, both civil and military, the former being regarded as concomitant to economic development, and

(b) data collection, climatological research and advice, meteorological research, advice and forecasting in relation to the development of natural resources, particularly water resources and the requirements of hydrologists.

2. In the richer countries the meteorological services are part of a complex of interdependent highly developed facilities and the introduction of new stations, equipment or techniques only infrequently poses problems connected with the other facilities. On the other hand, in most parts of the less developed areas these facilities, particularly electrical power supplies, telecommunication services, general communications and social services including adequate housing, educational and medical services for staff and families, are absent or present in only rudimentary form. Therefore, unless general development in these progresses as fast as developments in meteorology, it falls to the meteorological service to make special arrangements for their provision. This not only adds to the cost of the service but broadens the technical responsibilities which must extend to enhance other techniques than meteorology and deepens the administrative responsibilities in large staff welfare tasks. This means that there has to be a higher degree of flexibility in the administration than is normal in the services in better endowed countries.

3. For the services mentioned in 1(a), it is necessary to have a national synoptic network of surface and upper air stations feeding into an analysis centre and associated forecast centre or centres. Additional aeronautical meteorological stations may also be necessary. Details of the network density are given in World Meteorological Organization (WMO) Technical Regulations,

Part I, Chapter 2.2. In the analysis centre and in meteorological forecast offices it is necessary to collect and process not only the information from the national network but from vast surrounding areas of continental or even near-hemispherical extent using the most modern telecommunications techniques. Data analysis and forecasting must be performed by high-grade professional staff backed by research teams capable of developing new techniques. Unless the information and staff at the high levels are available, it is impossible to satisfy the international meteorological requirements for civil aviation as laid down in WMO Technical Regulations, Part II, Meteorological Service for International Aviation, and International Civil Aviation Organization (ICAO) publications, Annex 3 to the Convention, Procedures for Air Navigation Services, Meteorology, and Regional Supplementary Procedures. Guidance on the basic scientific knowledge and the particular aeronautical meteorological knowledge are given in Guide on Qualifications and Training of Meteorological Personnel Employed in the Provision of Meteorological Services for International Air Navigation, and Parts 6 and 7 of the Instruction Manual, both volumes being produced by the International Civil Aviation Organization.

4. The policy for the services, defined in paragraph 1(a) and amplified in paragraph 3, is usually determined by a Communications, Transport or Armed Forces Ministry. More often than not full responsibility for the general meteorological service with its many facets comes under one of these Ministries.

5. For the category mentioned in 1(b) the same network and forecast facilities and staff are required supplemented by a denser network of climatological, agricultural meteorological and special stations. Again it is not necessary to expound on this network as the requirements are fully defined in Technical Regulations of WMO. There must also be a data-processing unit with high-grade professional staff interpreting the data for the various users. The WMO Guide to Climatological Practices indicates the desirable standards of this branch of meteorology and Professor J. van Mieghem's Reports on Meteorological Training on behalf of WMO as well as previously mentioned publications, outline the standards required of the staff.

6. The work, outlined in paragraphs 1(b) and 5, in most countries comes within the province of a Natural Resources Ministry and often there is a separate Ministry responsible for water resources, irrigation or hydro-electricity.

7. The major problems of organizing a satisfactory meteorological service may be summarized broadly as follows:-

(a) Divided ministerial and departmental responsibilities. It is clear that meteorology has two separate tasks; one to satisfy aviation, and one to satisfy the non-aviation interests, mainly natural resources interests. These two groups of interests are usually catered for separately by two or more Ministries. For administrative convenience, meteorology is made to come under one or other of these Ministries with the consequence that, unless special arrangements are made, one aspect of the work tends to be adequately looked after but the other tends to suffer to a greater or lesser degree.

(b) Insufficient funds to meet the cost of -

(i) an adequate synoptic network and its associated analysis centre,

(ii) an adequate network of aeronautical meteorological stations and meteorological offices,
(iii) an adequate telecommunications network and its associated telecommunications centre,
(iv) an adequate network of climatological, agricultural meteorological and special stations with its associated processing facilities,
(v) adequate instrumentation, processing and computing facilities for research,
(vi) sufficient expatriate staff, mainly at professional and senior technical level, to cover the period until local staff are trained to take over.

(c) The intense competition for the very few adequately educated indigenous people. This affects all levels of staff and tends to result in an acceptance of lower standards. There should be the strongest opposition to attempts to lower standards which should be maintained at the levels given in the guidance material referred to in paragraphs 3 and 5. An interesting point arises here in connection with indigenous staff at the professional and senior technical level. It is assumed by many Governments that the high cost of expatriate staff, 7(b)(vi), will be reduced when properly qualified indigenous staff take over; in some countries there are already different, lower, salary scales. However, there is in fact a world-wide shortage of qualified meteorologists; no nation, however well developed, has a surplus, and a person with the proper qualifications need not look to his own country for employment. Employment at world-market rates can be found by emigrating, as a WMO or as an UN Technical Aid expert in another less developed country. For example, 13 vacancies with UN salaries were advertised by WMO during the period June to August 1962. It could well turn out that the retention of even indigenous officers will imply the paying of salaries at world-market rates.

8. Possible solutions to these problems are -

(a) The formation of a National Meteorological Committee to ensure effective liaison between the user departments and interests and the responsible Ministry or Ministries. The terms of reference should allow the Committee to ensure the proper provision of finance. Members should be representative of Government and non-Government interests in both aviation and non-aviation meteorology. Particularly in the latter there should be strong representation from the agricultural, forestry, animal industry and water resources disciplines. Both practical and research aspects of the science should be allowed representation. Research, particularly in the developing countries, is vital, and a Meteorological Research Committee as an advisory sub-committee of the National Meteorological Committee ensures that research planning can be undertaken.

(b) No developing country can afford from its own funds to supply a meteorological service on a scale appropriate to modern needs. Consequently, external finance is essential and funds must be sought from both international sources and charitable foundations having an interest either generally or in a particular sector of meteorological activity.

(i) Joint support WMO/ICAO schemes should be sought to meet international commitments for aviation meteorology in their synoptic and operational aspects. Although the great benefit of rapid air communications cannot be denied, it must not be forgotten that the design, construction and operation of large fleets of modern aircraft, expensive in every aspect, rests with a very few well-developed countries. Less well-endowed countries are asked to provide the expensive facilities for the operation of these aircraft. (Should they also operate a small national airline, they have little or no choice but to buy these costly aircraft and ancilliary equipment, thus increasing local costs). In some cases there is little chance for the poorer country to recoup costs, as often only a few landings may be made for many transit flights across the national airspace between centres with greater traffic potential and where alll aircraft flying through that airspace require the same degree of meteorological protection whether or not they are landing.

(ii) Other United Nations funds, funds provided by the richer nations under aid schemes, and funds from charitable foundations, should be sought to provide or support specialized research in meteorol -ogy, hydrology and climatology.

(iii) Expatriate staff, particularly of professional or senior technical level, must be sought through United Nations OPEX schemes or National Aid schemes where much or all of the cost is borne by the outside agency. As there is usually not a career prospect for expatriates within a developing country, schemes that allow the short-term attachment of meteorologists from other countries without hindering their career in their own service are valuable in securing persons who would otherwise not serve in the developing country. The temporary loss of service by the assisting country is repaid in the long run, not only by goodwill but by the gain in special experience on the part of their own staff.

9. At this point it is appropriate to mention another method that can result in the reduction of the cost of a service normally organized on a national basis. Weather knows no political boundaries, and synoptic analysis for general meteorology and aviation route forecasting requires observations from vast areas (vide paragraph 3) and it is common for analyses to be made for areas of 20,000,000 square miles or more in extent (approximately 52,000,000 square kilometres). Synoptic climatology, forecasting research and other aspects of meteorology are also best studied on this scale. Therefore it can readily be seen that where countries are not of great area in comparison with the analysis centre, and where they are close together, the work could as easily and effectively be done once, in one regional centre, rather than be duplicated in a number of national centres. Considerable savings in money on communications and staff could ensue, and the reduced demand for professional staff would allow a more effective deployment of the small numbers available. Africa, for example, could be served by less than six regional centres rather than by some thirty national centres. These centres could

be formed by mutual agreement, as, on a smaller than regional but larger than national scale, the co-operation between Tanganyika, Uganda and Kenya supports the East African Meteorological Department, or they could be organized by WMO. The latter is preferable as it would enable international standards to be maintained and common terms of service for staff to be established. WMO and ICAO have already called for studies on this type of centre and further progress is expected after the Fourth Congress of WMO in April 1963, and the joint meeting of the WMO Commission for Aeronautical Meteorology and ICAO Meteorological Division in late 1963.

10. Another major problem is the training of indigenous staff at all levels - assistant, technical and professional. Again, WMO is very conscious of this problem. Professor van Meighem's Reports on Meteorological Training on behalf of WMO provide valuable advice and, by the time this paper is presented, WMO at its Fourth Congress in April 1963 will have no doubt progressed further in the matter. Essentially, national training should be provided for the assistant grades and extra academic training as well as technical training may be necessary. For the technical grades, regional training centres under WMO should be formed (here, association with a regional analysis centre could be possible). For the professional grades, university courses must be made available. Both for the technical and the professional grades, national meteorological services must be prepared to give academic training to promising young people to bring them up to the required entrance standard. It is not sufficient over the next decade to hope for a sufficient output from existing educational systems.

11. There are also other problems associated with the organization of a meteorological service in the less developed countries, but these are mainly matters of staff management and welfare requiring above-normal administrative techniques from the senior staff. It is not sufficient merely to have good professional men who are capable of administration. The same degree of professional knowledge is required as everywhere else in the world, but associated with this must be administration coupled with a deep knowledge of local customs and a warm human understanding. For example, junior staff who in less developed countries lack world-wide background, find difficult the stern regime of an observational science demanding day and night work and find service in an area of different dietary and religious customs, different language and different climatic regimes from their own, to be strange and thus they need special understanding.

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